

### **Remarks**

As of the Final Office Action, claims 15-23 under 35 USC 103 as unpatentable over Henry U.S. Patent 4,388,124 (Henry). Claims 15-23 were also rejected under 35 USC 103 as unpatentable over Darolia U.S. Patent 6,444,057 (Darolia) or Tamaki U.S. Patent 6,051,083 (Tamaki), each reference taken by itself. The rejections were maintained in an Advisory Action mailed. Applicant timely filed a Notice of Appeal on September 18, 2007; this Request for Continued Examination followed. Claims 15-25 are currently pending.

#### **I. Amendments to the claims.**

Claims 15 and 19 are amended to incorporate a new limitation not previously considered by the Examiner in order to more particularly describe and claim the invention. New claims 24-25 are added. Support the amendments and new claims is found at least at paragraph [0013] and throughout the specification as originally filed; no new matter is presented.

#### **II. Rejections under 35 U.S.C. §103.**

The following principle of law applies to all §103 rejections. MPEP 2143.03 provides “To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).” [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the single applied prior art reference clearly does not arguably teach some limitations of the claims.

Claims 15-23 are rejected under 35 USC 103 as unpatentable over Henry. Claims 15-23 are also rejected under 35 USC 103 as unpatentable over Darolia or Tamaki. Applicant respectfully traverses the rejection.

The present invention is directed to a “method for selecting a reduced-cost nickel-base superalloy.” It requires first “identifying a baseline nickel-base superalloy having a first nominal composition,” and then “selecting a modified nickel-base superalloy having a second nominal composition.”

As far as Applicant can tell, Henry, Darolia or Tamaki each teach alloy compositions but none teach a “method for selecting a reduced-cost nickel-base superalloy” as recited in claims 15-23.

The present claims instead are to a method of designing an alloy starting with a baseline alloy, which none of the cited references address. In re Peterson and related composition-claim cases have no application here. Further, the claims recite compensating for the decrease in tantalum content by increasing a specific combination of other elements. What the inventors found is that expensive tantalum can be replaced with these less expensive elements while achieving comparable performance (Specification, para. [0007]). The references have nothing to do with that.

There is no recognition in Henry or the other cited references of the need to increase the hafnium, columbium, titanium and tungsten to make up for the loss of tantalum, much less that this combination of elements could make up for the loss of tantalum in a way that still provides satisfactory results. In fact, none of the eight exemplified compositions (A-H) of Henry contain any columbium at all (Figures 5, 8-10).

In further support of patentability, Applicant submits herewith a listing of tantalum statistics prepared by the U.S. Geological Survey downloaded from [minerals.usgs.gov/ds/2005/140/tantalum.pdf](http://minerals.usgs.gov/ds/2005/140/tantalum.pdf) and attached as Exhibit A. The second column from the left shows the unit value of tantalum per ton in equivalent (1998) dollars. If the invention were truly obvious as a result of motivation of high tantalum prices, then Henry – the earliest disclosed reference – would presumably have addressed that specific point. As the attached exhibit shows, tantalum prices were at record highs in 1978-1980, contemporaneous with the filing of the application that became the Henry patent and the parent application to which it claimed priority. Thus, Henry would have had the exact same motivation as the current inventors to significantly reduce tantalum content while sustaining alloy properties. However, as already discussed, Henry has no such teaching and specifically fails to recognize that an alternative nickel base superalloy can be selected in which a specific combination of elements can be used to offset the decreased tantalum amount and that the alternative nickel base superalloy can be substituted for use of a nickel base superalloy having a higher tantalum content.

Applicant maintains the position that the Examiner's arguments regarding optimization are inapposite because the instant claims are method claims, not composition claims. However, even if the Examiner's arguments on that topic were relevant, it is well established that "a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)." MPEP 2144.05(II)(B). Because that recognition came only from the

inventors of the instant application, not from any of the cited references, the rejection should be withdrawn.

New claims 24 and 25 are also believed to be allowable, also containing limitations which are not taught in any of the cited art.

### **CONCLUSION**

For at least the reasons set forth above, Applicant respectfully requests reconsideration of the Application and withdrawal of all outstanding rejections. Applicant respectfully submits that the claims are not rendered obvious in view of the cited art and thus, are in condition for allowance. Applicant requests allowance of all pending claims in a timely manner. If the Examiner believes that prosecution of this Application could be expedited by a telephone conference, the Examiner is encouraged to contact the Applicant's undersigned representative.

The Commissioner is authorized to deduct any fees determined by the Patent Office to be due from the undersigned's Deposit Account No. 50-1059.

Dated: November 19, 2007

Respectfully submitted,  
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Attorney Docket No.: 13DV-14043-5/11713 (21635-0096-D1)  
Application No.: 10/812,628

**Exhibit A**

TANTALUM STATISTICS<sup>1</sup>

## U.S. GEOLOGICAL SURVEY

[All values are in metric tons (t) tantalum unless otherwise noted]

Last modification: October 11, 2006

Year	Mine production	Secondary production	Producer shipments	Government shipments	Imports	Exports	Stocks	Apparent consumption	Unit value (\$/t)	Unit value (98\$/t)	World production
1964	0	23		184	353	54	1,790	231	17,500	92,100	
1965	0	32		75	385	57	1,870	352	20,900	108,000	
1966		45		251	608	59	2,090	632	35,000	176,000	
1967		50	405	260	955	64	2,310	785	27,600	135,000	
1968		41	362	0	558	95	2,090	472	17,500	82,200	
1969		16	446	98	360	104	1,950	586	19,200	85,260	388
1970	0	11	507	73	440	106	2,300	410	19,200	80,670	318
1971	0	14	436	3	464	91	2,150	536	17,500	70,420	496
1972	0	18	494	40	525	113	1,930	690	15,200	59,280	371
1973	0	18	682	121	566	146	1,810	682	21,500	78,930	384
1974	0	23	762	401	785	197	1,910	906	37,700	124,600	436
1975	0	2	392	39	423	194	2,080	100	43,100	130,600	411
1976	0	23	589	4	594	201	1,900	602	47,500	136,100	339
1977	0	20	646	0	933	244	1,860	670	66,300	178,300	409
1978	0	25	687	0	639	275	1,740	505	106,000	265,000	362
1979	0	23	771	0	868	327	1,250	653	249,000	559,000	476
1980		55	685	0	1,030	320	1,480	538	284,000	561,800	544
1981		43	447	0	717	101	1,570	572	101,000	181,100	403
1982		40	400	-15	493	154	1,450	481	60,600	102,400	284
1983		18	461	0	94	119		536	79,400	130,000	313
1984		59	582	0	330	174		762	86,100	135,100	315
1985		41	461	-115	119	145		363	61,200	92,710	315
1986		34	462	0	148	142		372	58,500	87,000	215
1987		57	506	0	127	171		381	70,000	100,400	275
1988		59	523	0	239	256		422	135,000	186,000	292
1989		54	372	0	536	195		376	72,700	95,570	395
1990		54		0	320	200		390	88,800	110,800	396
1991		50		0	359	180		370	76,000	90,950	477
1992		55		0	434	150		375	78,100	90,740	399
1993		60		0	457	170		410	70,000	78,960	292
1994		85		0	383	190		430	70,700	77,760	333
1995		100		0	481	220		515	74,700	79,890	361
1996		100		34	563	290		524	74,700	77,600	436
1997		115		20	467	340		570	88,800	90,180	562
1998		148		213	588	440		738	91,400	91,400	779
1999		110		5	564	480		555	91,400	89,400	656
2000		130		242	900	530		650	591,000	559,000	1,070

TANTALUM STATISTICS<sup>1</sup>  
U.S. GEOLOGICAL SURVEY  
[All values are in metric tons (t) tantalum unless otherwise noted]  
Last modification: October 11, 2006

Year	Mine production	Secondary production	Producer shipments	Government shipments	Imports	Exports	Stocks	Apparent consumption	Unit value (\$/t)	Unit value (98\$/t)	World production
2001	0	110		-53	1,160	640		550	99,500	91,600	1,180
2002	0	100		16	1,040	510		500	83,300	75,500	1,470
2003	0	100		335	770	580		500	75,300	66,700	1,280
2004	0	105		225	1,110	720		500	86,000	74,200	1,510

Compiled by D.A. Buckingham, L.D. Cunningham (retired), and M.J. Magyar.

Data are calculated, estimated, or reported. See notes for more information.

## Tantalum Worksheet Notes

### Data Sources

The sources of data for the tantalum worksheet are the mineral statistics publications of the U.S. Bureau of Mines and the U.S. Geological Survey—Minerals Yearbook (MYB), Mineral Commodity Summaries (MCS), Mineral Facts and Problems (MFP), and Metal Prices in the United States through 1998 (MP98). The years of publication and corresponding years of data coverage are listed in the References section below. Tantalum data prior to 1964 were not included in the tantalum statistics worksheet because they were either recorded in gross weight, combined with columbium data, ambiguous in detail, or were not available. Zeros are used where data are actually "0." Blank cells in the worksheet indicate that data either were not available or were withheld because they are proprietary.

### Mine Production

Mine production data represent the tantalum content in tantalum-bearing ores and mineral concentrates that were mined within the United States. Mine production data for the years 1966–69 and 1980–82 were withheld because they were proprietary. A small, unreported quantity of tantalum contained in tantalum-bearing concentrates was produced in the years and 1989–92. No mine production of tantalum-bearing ores and mineral concentrates occurred for the years 1964–65, 1970–79, 1983–88 and for the years 1993–2004, as reported in the MYB.

### Secondary Production

Secondary production represents the tantalum content in tantalum scrap materials that was consumed in the United States. Secondary production data for the years 1964–83 were recorded from the MFP. Secondary production data for the years 1984–2004 were recorded from the Commodity Specialists data.

### Shipments

Shipment data for the years 1964–2004 were recorded from the MYB and the MFP. Producer shipment data for the years 1967–89 represent the tantalum content in tantalum metal, alloy additives, carbides, power, scrap, and other tantalum materials that were shipped by domestic producers. Producer shipments data the years 1964–66 and 1990–2004 were not available. Government shipment data for the years 1964–2004 are shipments or releases of tantalum-bearing materials from the National Defense Stockpile (NDS). Negative numbers for the years 1982 and 1985 indicate U.S. Government inventory acquisitions.

### Imports

Import data for the years 1964–68 were recorded from the MFP. Import data for the years 1969–2004 were recorded from the MYB. Import data for the years 1964–82 represent the tantalum content in tantalum mineral concentrates, metal, alloys, tin slags, synthetic concentrates, and other tantalum materials that were imported into the United States for consumption purposes. Import data for the years 1983–2004 represent the tantalum content in tantalum mineral concentrates, metal, and alloys that were imported into the United States for consumption purposes, and do not include the quantity of contained tantalum in imported tin slags, synthetic concentrates, and other tantalum materials.

### Exports

Export data represent the tantalum content in various tantalum materials that were exported from the United States. Export data for the years 1964–75 were recorded from the MFP. Export data for the years 1976–2004 were recorded from the MCS.

### Stocks

Stock data for the years 1964–82 represent the tantalum content in various tantalum materials that were held in industrial producer or processor inventories. Stock data for the years 1964–82 were recorded from the MFP. Beginning in 1983, domestic tantalum stock data were not available.

### Apparent Consumption

Apparent consumption data represent the tantalum content in various tantalum materials that were consumed within the United States annually. Apparent consumption data for the years 1964–75 were recorded from the MFP. Apparent consumption data for the years 1976–2004 were recorded from the MCS.

### Unit Value (\$/t)

Unit value is defined as the value of 1 metric ton (t) of tantalum apparent consumption. Unit value data for the years 1964–2004 are based on the yearend average value, in \$/lb, of tantalite and converted to contained tantalum using the equation below.

$$\text{UNIT VALUE} = (\text{YEAREND AVERAGE VALUE} * 2,204.623) / (0.82)$$

Unit value data were recorded from the MP98 and the MYB.



**Unit Value (98\$/t)**

The Consumer Price Index conversion factor, with 1998 as the base year, is used to adjust unit value in current U.S. dollars to the unit value in constant 1998 U.S. dollars.

**World Production**

World production data for the years 1964–68 were not available. World production data for the years 1969–2004 represent the tantalum content in tantalum-bearing ores and mineral concentrates that were produced from mines throughout the world. World production data for the years 1969–2004 were recorded from the MYB.

**References**

- U.S. Bureau of Mines, 1933–96, *Minerals Yearbook*, 1932–94.
- U.S. Bureau of Mines, 1975, *Mineral Facts and Problems*, 1975 ed.: U.S. Bureau of Mines Bulletin 667.
- U.S. Bureau of Mines, 1978–95, *Mineral Commodity Summaries*, 1978–95.
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- U.S. Geological Survey, 1997–2006, *Mineral Commodity Summaries*, 1997–2006.
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- U.S. Geological Survey, 1999, *Metal Prices in the United States through 1998*.
- U.S. Geological Survey and U.S. Bureau of Mines, 1996, *Mineral Commodity Summaries*, 1996.

**Recommended Citation Format:**

U.S. Geological Survey, [year of last update, e.g., 2005], [Mineral commodity, e.g., Gold] statistics, in Kelly, T.D., and Matos, G.R., comps., *Historical statistics for mineral and material commodities in the United States: U.S. Geological Survey Data Series 140*, available online at <http://pubs.usgs.gov/ds/2005/140/>. (Accessed [date].)

**For more information, please contact:**

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